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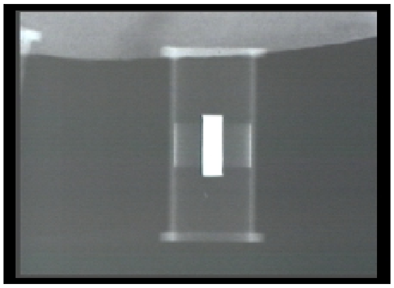
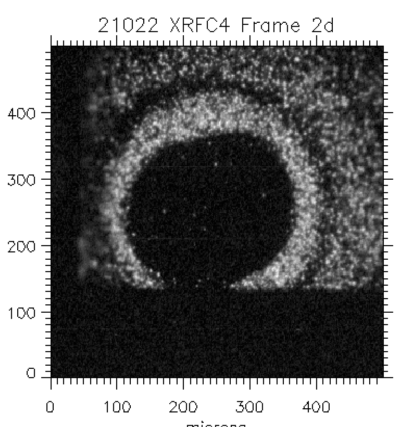
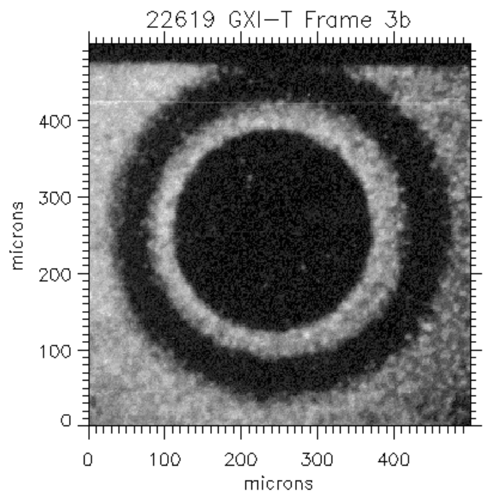


Initial Cylindrical Double Shell Experiments

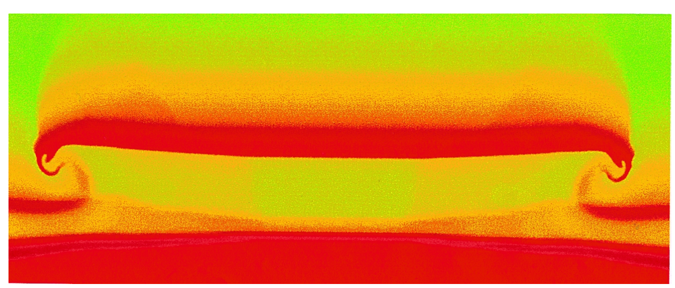
Hydrodynamic experiments in cylindrical geometry capture important convergent effects while(in contrast to spherical implosions) allowing diagnostic line-of-sight along important interfaces. In September 2000, Steve Batha of P-24 began a series of cylindrical double shell experiments designed by collaborators from AWE in the United Kingdom (led by Kenneth Parker and Mike Dunne). These experiments were performed on the OMEGA Laser at the Laboratory for Laser Energetics at the University of Rochester, using direct laser drive to implode the cylinder hydro-dynamically. The targets were precision fabricated and assembled by the MST-7 target assembly team led by Bob Day. The static radiograph above shows the initial direct-drive cylinder with a dichloropolystyrene marker band axially in the middle and a 250 µm aluminum wire providing the inner shell. Below is an axial radiograph during the implosion, at the time the rebounding shock reaches back out to the marker layer. The radiograph shows (from the inside out) the aluminum solid shell, a gap with high x-ray transmission between the shell and the marker, the dark marker layer, and the ablator outside that.

This successful proof-of-principle led to experiments in February, 2001 measuring mix at these interfaces. Best results were obtained with a new design using a nickel marker layer (thicker than the gold marker usually used in the high-mix experiments) and a copper wire for the inner shell. Shown at right is a frame from the experiment at approximately 4.3 ns. Again, this time is close to the time the shock rebounding off the inner shell reaches back to the outer shell. One can also see an example of the improvements possible in x-ray imaging, which was an additional goal of this experimental run.





Shown for comparison below is a computer simulation by Glenn Magelssen of X-2, using the RAGE code in a r-Z (radius vertical, axial distance left-to-right) geometry at approximately 4.5 ns. The different colors correspond to different densities in the calculation. This simulation assumes perfectly smooth interfaces; Direct Numerical Simulations (DNS) using the measured surface roughness to calculate the resulting mix are underway by John Scott, also of X-2. Future experiments will address such physics such as the mix resulting from the interaction of the rebounding shock with the initial mix layer.



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